

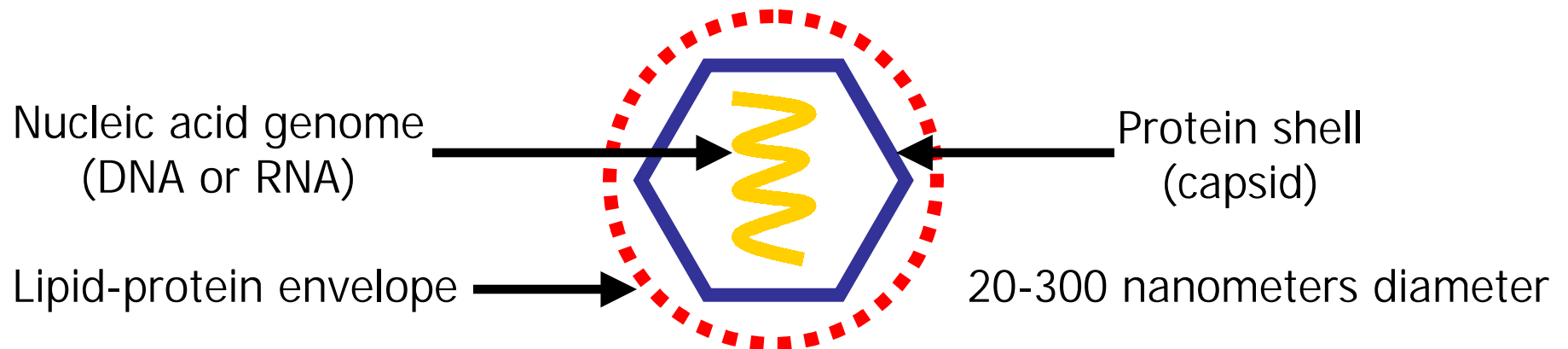


Strategies for Norovirus Infection Control

Robert E. Wheeler, MD, FACEP
Voyager Medical Seminars

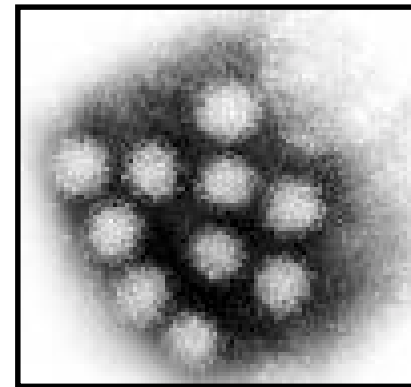
Viruses

- Ultra-microscopic obligate IC parasites
- Relatively simple in structure and composition
- With or without a lipoprotein envelope



Norovirus

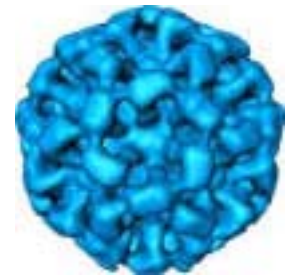
- Norwalk Virus, Norwalk-like virus, NLV
- SRSV (Small Round Structured Virus)
- 2002
 - Family – Caliciviridae
 - Genus – Norovirus
 - Genogroups – I, II, III, IV
 - Multiple clusters/strains



Norovirus
Electron Micrograph

Norovirus

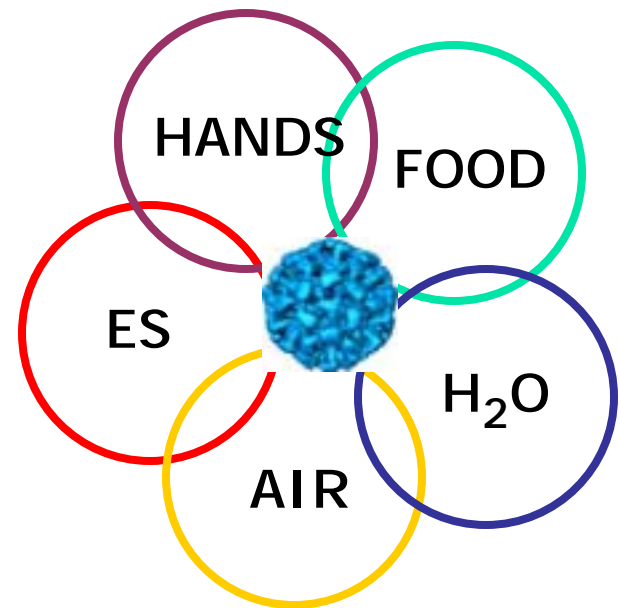
- Non-enveloped ssRNA virus
- 27-35 nm in size (SRSV)
- Infectious dose of 10-100 virus particles
- Viral shedding of 3 weeks or more
- Survives 0°C, 60°C, chlorine 10 ppm
- Limited (few months) immunity



Norovirus
3-D

Norovirus Transmission

- “Fecal-oral” route
- Mouth ↔ Gut (Replication) → Anus
- Food
- Water
- Air
- Environmental surfaces
- Hands





Norovirus Transmission

- Food (39%)
- Hands (12% "person to person")
- Water (3%)
- Air (aerosolization with vomitus)
- Environmental surfaces (fomites)
- 46% unknown or no data available

MMWR 2001; 50: RR-9

Foods Most at Risk

- Shellfish (oysters, clams, mussels)
- Ready to eat foods that require handling but no subsequent cooking
 - Salads
 - Peeled fruits
 - Deli-sandwiches
 - Finger foods
 - Hors d'oeuvres
 - Dips
 - Communal foods



Norovirus

Food Contamination

- Source
 - Shellfish from contaminated water
 - Contaminated water used for irrigation
 - Sewerage used as fertilizer
- Processing
- Preparation
- Food handlers
- Guests
- Insects





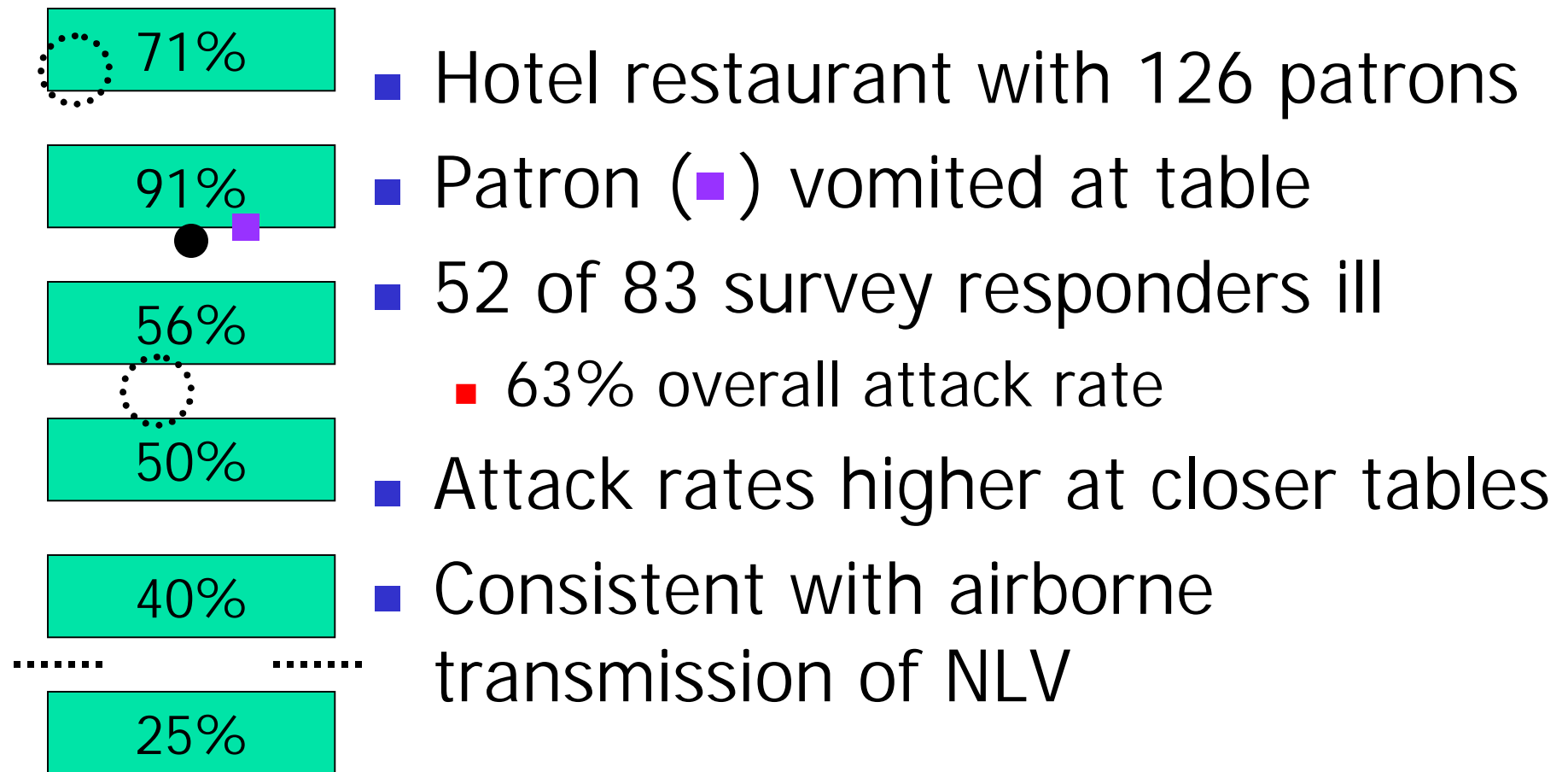
Norovirus

Water Contamination

- Typically via improper sewerage treatment or overflow
- Surface water
 - Ponds, lakes, streams, rivers, reservoirs
- Well water
- Swimming pool water
- Ice

Evidence for airborne transmission of Norwalk-like virus (NLV) in a hotel restaurant;

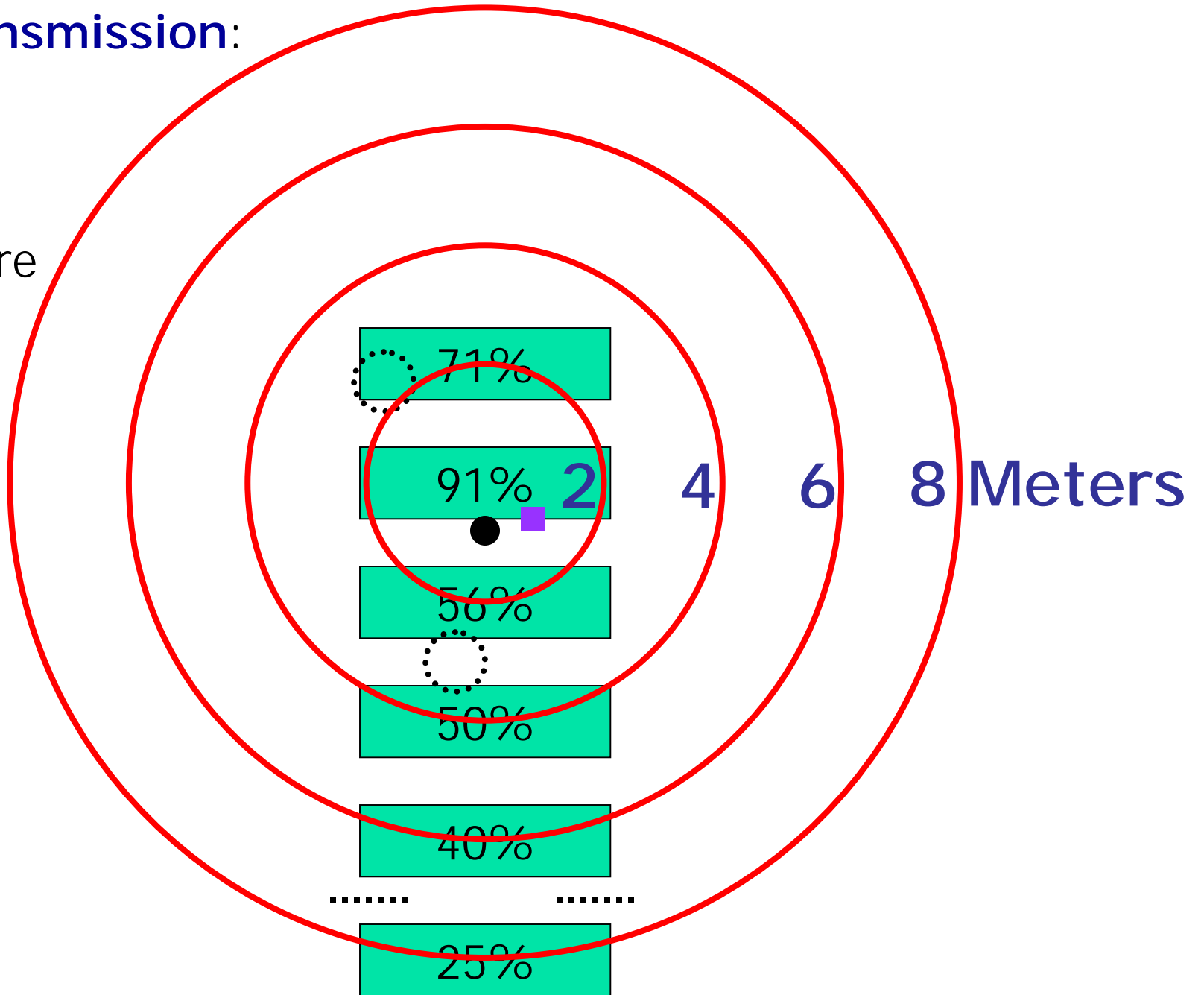
PJ Marks; Epidemiol. Infect. 2000, 124: 481-487

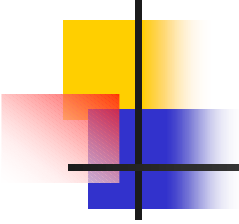


Viral transmission:

- Air
- PTP
- ES
- Dinnerware
- Food
- Water

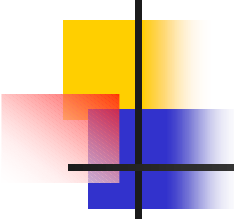
-
- Distance
- Time
- Air flow





Transmission of Norwalk Virus During a Football Game;
Becker KM, Moe CL, Southwick KL, MacCormack JN;
NEJM, 2000 Oct 26; 343(17):1223-7

- Duke vs. FSU, September 19, 1998
- 36 Blue Devils with N/V/D on game day
- 11 Seminoles became ill 24 hours later with the **Blue Devils Revenge**
- Only association was contact on the field
- **Barf Bowl** final score: FSU 62, Duke 13



Widespread environmental contamination with NLV detected in a prolonged hotel outbreak of gastroenteritis; JS Cheeseborough; Epidemiol Infect 2000, 125: 93-98

- RT-PCR environmental surface testing +
 - Carpets (known vomiting) 5/8 (62%)
 - Carpets (no vomiting) 9/12 (75%)
 - Toilet rims/seats 8/11 (73%)
 - Toilet handles, taps, basins 13/39 (39%)
 - Horizontal surfaces below 1.5 m 11/29 (37%)
 - Horizontal surfaces above 1.5 m 6/12 (50%)
 - Phones, door handles, etc. 7/29 (24%)
 - Soft furnishings 2/10 (20%)
 - Total 61/144 (42%)

It's Everywhere!

Norovirus Infection

- “Stomach flu”
- “Lurgy”
- “Winter vomiting disease”
- 24-48 hour incubation period
- 12-60 hour duration of illness
- A “mild” and short lived illness



Norovirus Infection Symptoms

- **Diarrhea**
- **Vomiting**
- Nausea
- Abdominal cramps
- Headache, muscle aches
- Fever (minority)
- Dehydration in young and elderly victims
- Up to 30% may be asymptomatic



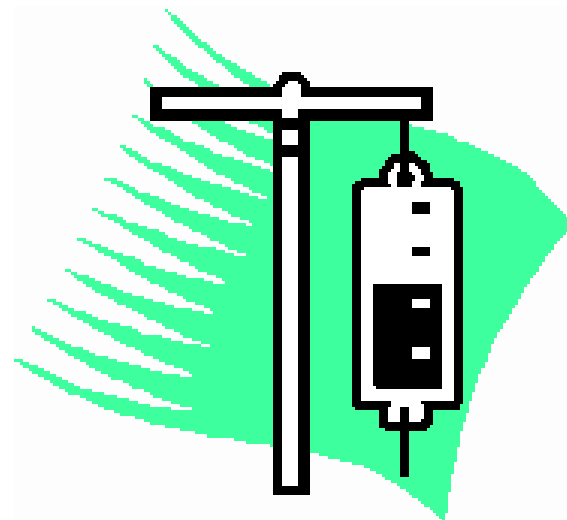


Norovirus Detection

- Reverse transcriptase polymerase chain reaction (**RT-PCR**) of stool, vomitus and environmental surfaces
 - Sequencing for genotype and cluster ID
- ELISA test kit (IDEIA™ NLV)
- Direct & immune EM of stool samples
- 4-fold increase in acute and convalescent IgG serum antibodies

Norovirus Infection Treatment

- Symptomatic therapy
 - PO, IV fluids
 - Antispasmodics
 - Analgesics
 - Antipyretics





2002: “Year of The Norovirus”

- VSP reports 23 shipboard AGE outbreaks
- 12 determined to be due to Norovirus
- 9 others of unknown or pending etiology
- In excess of half of the outbreaks were definitely due to Norovirus and several others were probably due to Norovirus



2002: “Year of The Norovirus”

It really wasn't our fault!



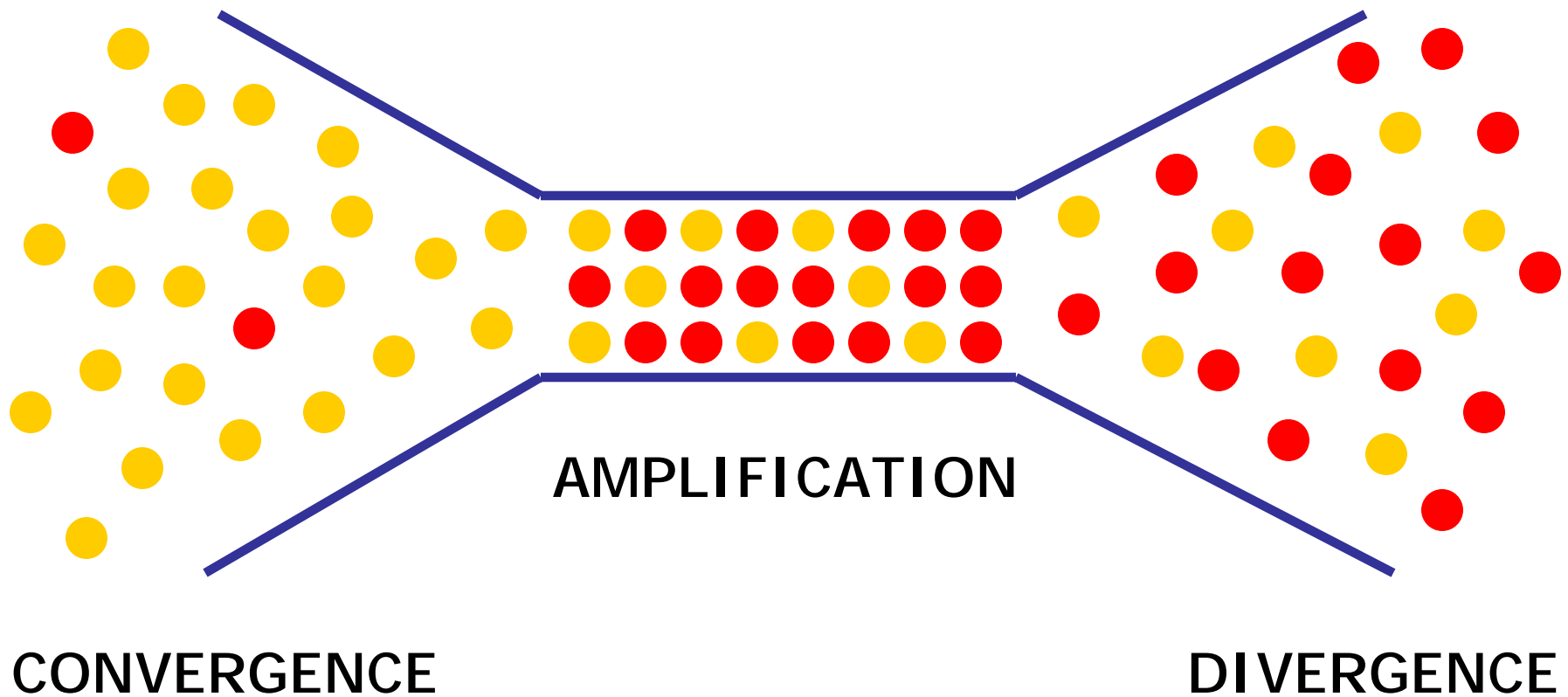


2002: “Year of The Norovirus”

Similar increase in Norovirus cases shoreside:

- Hotels
- Restaurants
- Theaters
- Hospitals
- Nursing homes
- Day care centers
- Schools
- Dormitories
- Military barracks
- Trains
- Buses
- Aircraft

Amplification of Disease Transmission





2002: “Year of The Norovirus”

- Accounts for 2/3 of all acute gastroenteritis (AGE) in the United States
- Causes 33% of hospitalizations and 7% of deaths due to AGE
- 23-25 million cases, 8% of population in U.S.
- Incidence of cases aboard cruise ships in 2002 was only ~ 0.025% of total cruise passengers



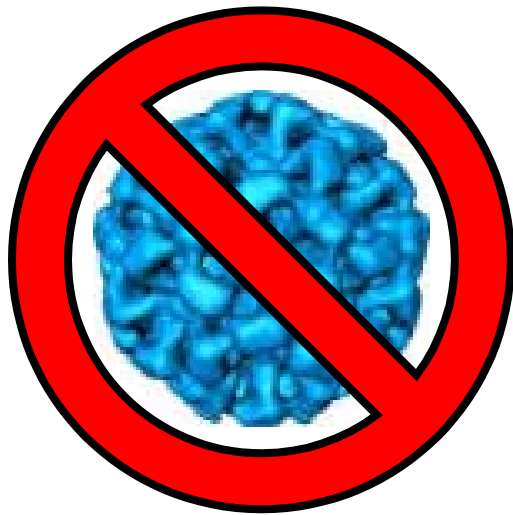
Norovirus

Critical Characteristics

- Highly contagious
- Multiple modes of transmission
- Stable in the environment
- Resistant to routine disinfection methods
- Asymptomatic infections
- Limited immunity



Norovirus Control



- Prevention Plan
- Surveillance Plan
- Response Plan



Prevention & Surveillance

- **NOROVIRUS AWARENESS**
- Shipboard Sanitation
 - International maritime regulations
 - Cruise industry guidelines
 - Corporate policies and procedures
 - Multi-departmental shipboard protocols
 - CDC Vessel Sanitation Program
- Disease surveillance and reporting by the shipboard medical staff

Shipboard Sanitation

- Cruise ships are often characterized as "floating cities"
- Sanitation needs and requirements are indeed similar to those of a small town





Shipboard Sanitation

- Food, water, air
- Living quarters (passenger and crew)
- Public areas
- Waste (trash, garbage, sewerage, HAZMAT)
- Pests (vermin, insects)

Shipboard Sanitation Department Collaboration

- Industry guidelines and standards
- Corporate policies & procedures
- Ship's Command
- Hotel
- Food & Beverage
- Housekeeping
- Engineering
- Environmental
- Medical



Shipboard Sanitation - Food

- HACCP Program
- Reliable suppliers
- Strict quality control
- Proper food storage
- Inventory control
- Food separation





Shipboard Sanitation - Food

- Sanitary preparation and serving areas
- Appropriate cooking and serving temps
- Clean-rinse-sanitize process for cookware and dinnerware
- Strict hygiene protocols for food handlers

Shipboard Sanitation - Water

- Bunkering of water only from safe sources
- Water desalination
 - Distillation
 - Reverse osmosis
- Filtering
- Halogenation
- Continuous monitoring of water quality



Shipboard Sanitation - Air

- Filtering
- Air exchange
- Temperature control
- Humidity control
- Duct cleaning



Passenger Living Quarters

- Passenger staterooms are cleaned at least twice daily
- Disinfectants routinely used on bathroom and high hand-contact areas



Crew Living Quarters

- Daily cleaning
- Crew sanitation regulations
- Weekly inspections



Public Areas

- Daily cleaning
- Repeat cleaning with additional use
- Disinfection of heavy hand-contact and soiled/contaminated areas





Waste Management

- Adherence to international regulations
- Separation & recycling
- Incineration
- Bilge, waste water & sewerage treatment
- Off-loading of hazardous materials



Pests

- Rare on modern cruise ships due to the strict sanitation protocols in place
- Rats, mice, flies, ants, cockroaches, silverfish
- Continuous surveillance
- Pesticides as needed



The Vessel Sanitation Program

- Centers for Disease Control & Prevention
- Established in 1975
- Minimize the risk of diarrheal outbreaks
- Assist the cruise industry in the development and implementation of environmental health programs



The Vessel Sanitation Program

- Environmental Health Officers (EHO)
- Twice-yearly unannounced comprehensive food safety and environmental sanitation inspections of vessels with a foreign itinerary that call on a U.S. port and carry 13 or more passengers



The Vessel Sanitation Program

- Ongoing surveillance of GI illness
- Conduction & coordination of outbreak investigations on affected vessels
- Food safety and environmental sanitation training seminars for vessel and shore operations management personnel



The Vessel Sanitation Program

- Consultative services for reviewing plans for renovations and new construction
- Construction inspections at the shipyards and when the vessel makes its initial call at a U.S. port
- Dissemination of information to the public

www.cdc.gov/nceh/vsp



VSP Inspections

- 100 point scoring system
- Score of 86 is considered satisfactory
- Storage, distribution and halogenation of water supply
- Storage, preparation and service of food
- Practices and personal hygiene of employees



VSP Inspections

- Equipment maintenance
- Dishwashing procedures
- Solid and liquid waste disposal
- Toilet and hand-washing facilities
- Pest and toxic substances control



VSP Inspections

Reportable GI Illness

- Diarrhea

- 3 or more episodes of loose stools in a 24 hour period

or

- Vomiting plus one additional symptom

- One or more episodes of loose stools in a 24 hour period, or abdominal cramps, or headache, or muscle aches, or fever



VSP Inspections

Disease Surveillance & Reporting

- Gastrointestinal Illness Log
- Anti-diarrheal Medications Log
- Gastrointestinal Illness Questionnaire
- 24 hour GI Illness Report
- 2% and 3% threshold GI Illness Reports
- Passenger and crew pre-boarding questionnaire for Norovirus symptoms

Norovirus Response Plan

- Isolation
- Containment
- Disinfection
- Investigation
- Information/Education





Isolation

- Confine infected crew and passengers to quarters until 3 days after cessation of symptoms or disembark them from the ship for that period
- Consider relocating unaffected cabin mates
- Provide instruction on appropriate personal hygiene, especially handwashing

Natural History of Human Calicivirus Infection: A Prospective Cohort Study

B Rockx; CID 2002, 35: 246-53

- 99 people infected with Norovirus

Viral Shedding (via RT-PCR):

- Day 1 78%
- Day 8 45%
- Day 15 35%
- Day 22 26%





Containment

- Restrict access to soiled/contaminated areas until cleaned and disinfected
- Utilize specially trained and equipped “Hit Squads” or “SWAT Teams” for vomitus or diarrhea contamination incidents



NOROVIRUS

SPECIAL WEAPONS AND TACTICS

- Covered 2½-5 gallon SWAT BUCKET
- Gloves, mask, gown, safety glasses
- Disinfectant in 1 liter/quart spray bottle
- Absorbent powder or gel
- Scraper, dust pan
- Paper towels / disposable rags
- Alcohol-based hand sanitizer
- RED plastic biohazard bags



NOROVIRUS

SPECIAL WEAPONS AND TACTICS

- Cordon off the contaminated area
- Spray disinfectant directly onto gross contaminants (vomit or stool) and/or cover the area with disinfectant soaked paper towels or rags for the appropriate contact/dwell time (5-10 minutes)
- Clean surface of gross contaminants



NOROVIRUS

SPECIAL WEAPONS AND TACTICS

- Apply disinfectant to the soiled surface for a 5-10 minute dwell time or let air dry
- Dispose of vomitus/stool, contaminated rags, paper towels, gloves, gown, mask, etc. in a **RED** plastic biohazard bag
- Clean hands with soap & water and/or an alcohol-based hand sanitizer



NOROVIRUS

SPECIAL WEAPONS AND TACTICS

- Open the room to outside air
- Soiled carpets and upholstery can be steam cleaned after the chemical disinfection
- Air dry rugs and furniture in the sunlight



Containment

- Provide medical evaluation for those with active vomiting or diarrhea in an area of the infirmary away from non-afflicted patients or in their cabins
- Adhere to universal precaution protocols (gloves, gown, mask) when providing medical care to acutely ill patients
- Waive charges for medical services



Containment

- Promptly bag & clean soiled linens or dispose of them as hazardous waste
- Advise against the use of public restrooms
- Halt inter-ship crew transfers



Containment

- Remove any potentially contaminated food, beverages and ice from service
- Close self-serve buffet lines or frequently change the serving utensils or change to a served buffet line

Disinfectants for Norovirus

- The Norovirus cannot be grown in culture
- Efficacy testing of disinfectants for Norovirus is done using a surrogate virus, typically the **feline calicivirus (FCV)**, a similar non-enveloped ssRNA virus

FCV

Donor Card



Name: **DIVA**
Age: **5 years**
Breed: **Persian**
Attitude: **BAD**

DISINFECTANT LEVEL FOR VARIOUS PATHOGENS

PATHOGEN

DISINFECTANT LEVEL

Bacteria with spores Protozoa with cysts	Chemical Sterilant
Mycobacteria	High
Non-enveloped viruses Norovirus	Intermediate
Fungi	Intermediate
Vegetative bacteria Enveloped viruses Coronavirus	Low



Inactivation of Feline Calicivirus, a Norwalk Virus

Surrogate; JC Doultree; J Hosp Infect 1999, 41:51-57

- Effective disinfection agents
 - Glutaraldehyde 0.5%
 - Iodine 0.8%
 - Hypochlorite 1000 ppm (freshly reconstituted)
Household bleach required 5000 ppm
- Ineffective disinfection agents
 - QUAT 1:10
 - Ethanol 75%
 - Anionic detergent 1%

Inactivation of Feline Calicivirus, a Norwalk Virus

Surrogate; JC Doultree; J Hosp Infect 1999, 41:51-57

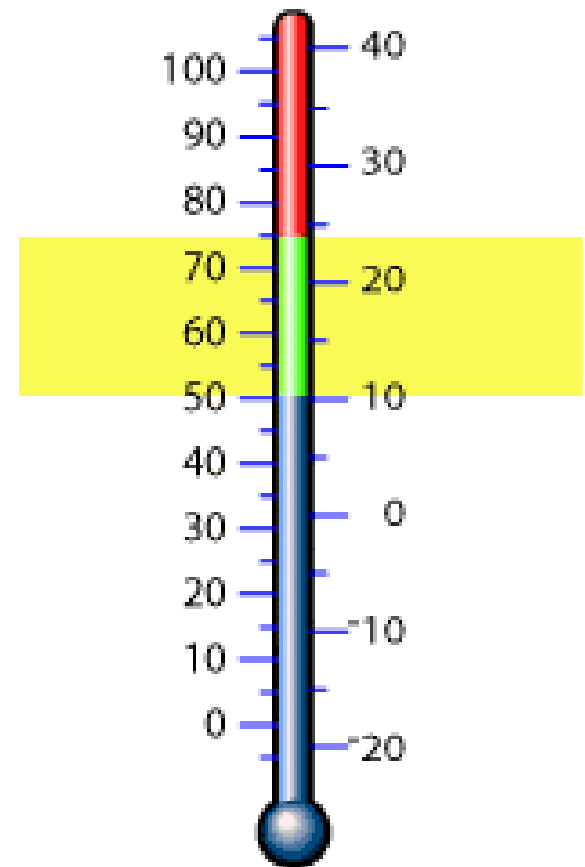
- Heat inactivation of FCV
 - 56°C for 60 minutes, complete inactivation
 - 70°C for 3 minutes, 6.5 log₁₀ reduction
 - 70°C for 5 minutes, complete inactivation
 - 100°C for 1 minute, complete inactivation

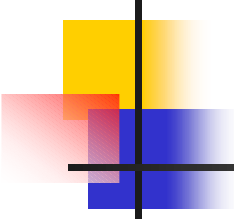


Inactivation of Feline Calicivirus, a Norwalk Virus

Surrogate; JC Doultree; J Hosp Infect 1999, 41:51-57

- Surface survival of dried FCV
 - 4°C, > 60 days
 - 20°C (RT), 21-28 days
 - 37°C, less than 1 day





Efficacy of Commonly Used Disinfectants for the Inactivation of Calicivirus on Strawberry, Lettuce and Food Contact Surfaces; BR Gulati; J of Food Protection 2001, 64(9):1430-1434

- Phenolic compounds at **2-4 times** the recommended concentration completely inactivated FCV on contact surfaces
- Hypochlorite (liquid bleach) **5000 ppm** was needed to inactivate FCV
- QUATS were ineffective
 - Effective when 2% sodium bicarbonate added

Disinfectants for Norovirus

Consider:

- Efficacy
- Spectrum
- Versatility
- Ease of use
- Safety profile
- Cost





Disinfectants for Norovirus

- When selecting a disinfectant, it's important to consider the product's entire formulation since there may be significant disinfectant action synergism produced by the specific combination of ingredients.



Disinfectants for Norovirus

- Accelerated Hydrogen PeroxideTM (AHPTM)
- Chlorine dioxide + QUAT (Cryocide 20TM)
- Hypochlorite (bleach)
- Parachlorometaxyleneol (EcoTru[®])
- Peroxymonosulphate (Virkon[®])
- Phenols (Mikro-Bac II[®], Mikro-Bac 3[®])



Accelerated Hydrogen Peroxide™

AHP™



- 0.5% hydrogen peroxide solution
- Broad spectrum biocide
- Cleans and disinfects
- Concentrate, wet-wipes and RTU liquid

Accelerated Hydrogen Peroxide™

- Non-toxic in RTU form
- Environmentally safe
- 5 minute dwell time
- 24 month shelf life
- May leave an easily removed, non-toxic surfactant residue on some surfaces





Chlorine Dioxide/QUAT

- **CRYOCIDE 20TM**
- Stabilized ClO₂ (0.75%)
plus twin chain QUAT solution
- ClO₂ is a strong oxidizing agent
- Broad spectrum biocide
- Reportedly effective in several UK and European hotel Norovirus outbreaks



Chlorine Dioxide/QUAT

- Wet fog and spray/wipe disinfection
- Use full strength or a 1:4 dilution
- 12 month shelf life (dated at plant)





Chlorine Dioxide/QUAT

- Effective as a surface disinfectant and fogging agent with a 30 minute dwell time
- Safe with most fabrics
- Non-corrosive
- May be mildly irritating to skin & eyes
- Avoid mixing with acids or chlorine
 - Can promote toxic ClO_2 gas formation



Hypochlorite (bleach)

- Broad spectrum biocide
- Inexpensive and readily available
- Use freshly prepared (daily) solution reconstituted from a dry hypochlorite compound to ensure the 1000 ppm effective concentration required for Norovirus



Hypochlorite (bleach)

- Organic debris reduces its effectiveness
 - Cleaning of surface required prior to disinfection
- Used mainly on hard, non-porous surfaces
- Damaging to many textiles
- Corrosive to metals



Hypochlorite (bleach)

- May produce toxic chlorine gas if combined with certain other compounds
- Can be irritating to skin, eyes, mucous membranes and lungs (fumes)
- The gold (“plated”) standard for Norovirus disinfection



Parachlorometaxylenol (PCMX)

- EcoTru[®] (EnviroSystems, Inc.)
- 0.20% parachlorometaxylenol
- Broad spectrum biocide
- Cleans and disinfects
- Leaves no residue
- Non-staining
- RTU liquid and wipes
- 18 month shelf life



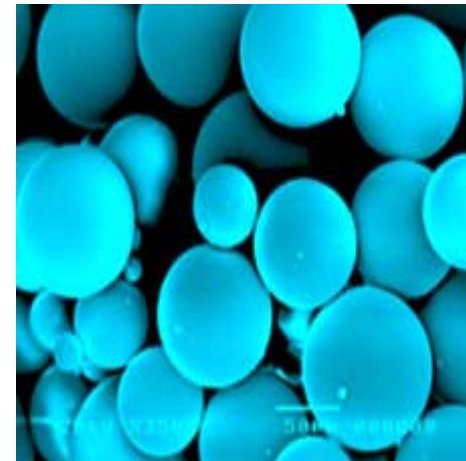
Parachlorometaxyleneol (PCMX)

- Non-toxic (EPA Tox Category IV)
 - No cautions
 - No oral, dermal or inhalation toxicity
 - No eye or skin irritation
- Hypoallergenic
- Biodegradable
- Non-corrosive
 - Approved for use on aircraft



Parachlorometaxyleneol (PCMX)

- Nano-emulsion of charged spheres
- Efficacy against Norovirus
 - 30 minute dwell time
 - Spray and air dry
 - Fogging
 - Cold
 - Electrostatic





Peroxymonosulphate

- Virkon[®] (Antec International)
- Broad spectrum disinfection
- Six synergistic biocides
- ~1000 ppm free chlorine in solution
- Powder form
- Non-toxic in prepared 1% or 2% solution
- Biodegradable



Peroxymonosulphate

- Proven efficacy (as a 2% solution) on carpet material against FCV, a Norovirus surrogate
- May leave a fine film on some surfaces
- Acid sensitive surfaces require rinsing
 - Granite, marble
 - Aluminum, brass, copper
- 3 year shelf life (powder)
7 days mixed solution





Phenols

- Mikro-Bac II[®], Mikro-Bac 3[®]
- o-phenylphenol, o-benzyl-p-chlorophenol
- Liquid concentrate
- Cleans & disinfects
- Dilute concentrate with water 1:128
 - Consistent with the concentration reported to be effective for the disinfection of FCV as a Norovirus surrogate (Gulati; JFP 2001)





Phenols

- Phenols should not be used in food preparation/food service areas or in areas where infants and young children might be exposed to the solution or its residue
- Phenols now have very limited use in health care facilities

These restrictions are due to the toxicity of phenols to various organ systems



Phenols

- Potential toxicity from o-phenylphenol, o-benzyl-p-chlorophenol and ethylene glycol (anti-freeze)
 - Skin, brain, kidneys, liver, lungs
 - o-phenylphenol is listed as a carcinogen
 - Ethylene glycol is listed as a teratogen
 - Hazardous to the aquatic environment

PerfectCLEAN[®] Microfiber

- A non-chemical alternative for disinfection
- Fiber matrix of 8 triangular threads
- > 90,000 microfibers per square inch
- Cleaning wipes, towels, mops
- Pathogens absorbed into the fabric
- 3-4 log₁₀ reduction of surface FCV
- Essentially no transfer of FCV from fabric





Disinfectants for Norovirus

To make an informed choice of disinfectants:

- Request/demand company and independent testing data from the manufacturer or distributor that supports their efficacy claims against FCV/Norovirus
- Test the disinfectant for adverse effects on your own ships' environmental surfaces



Disinfection

- Institute enhanced food preparation and food service environmental surface disinfection procedures
- Apply hypochlorite (bleach) 1000 ppm and then rinse with potable water
 - The usual 200 ppm “no-rinse” hypochlorite solution is not effective against Norovirus

Disinfection

- Restaurants
- Bars, lounges
- Showrooms
- Casinos
- Game rooms
- Library
- All passenger and crew public areas
- All passenger and crew cabins



Disinfection

- Consider any and all heavy hand contact surfaces to be contaminated
 - Door handles, push plates
 - Railings, elevator buttons
 - Telephones, keyboards
 - Pens, pencils
 - Tables, counters
 - Casino chips, cards, slot machines
 - Sports equipment
 - Etc., etc., etc.



Disinfection



- Public restrooms
 - Stall doors and latches
 - Toilet seats and handles
 - Faucets
 - Towel dispensers
 - Floor
- Cabin bathrooms

Disinfection

- Indoor and outdoor facilities
 - Lounge chairs
 - Swimming pools
 - Hot tubs
 - Gymnasium
- Children's areas





Disinfection

- Steam cleaning
 - Soiled carpets and furniture
 - Must reach **70°C for 5 minutes** at the contaminated surface to be effective against FCV/Norovirus
- Consider chemical disinfection of soiled areas prior to steam cleaning



Fogging

- Applies small droplets of disinfectants to the air and environmental surfaces
- Rapid environmental surface coverage
- Effective for disinfection of horizontal surfaces and air but not vertical surfaces, under surfaces, or shadowed areas
- Cold vs. thermal vs. electrostatic



Major Uses for Fogging

- Livestock pens/barns
- Food processing plants
 - Usually preceded by surface cleaning and spray disinfection
 - Reduces airborne microbial contamination and applies disinfectants to surfaces
 - 15-30 minutes of active fogging
 - 45-60 minutes for fog to settle and air to clear



Fogging

- Most health authorities do not recommend the use of fogging in healthcare facilities
 - Efficacy vs. spray & wipe disinfection
 - Question need for full surface disinfection
 - Logistics – where do we put the patients?
 - Potential adverse reactions of already ill people to the fogging agents



Fogging

- Increasingly used in hotels, cruise ships, trains, tour buses, airliners
 - Anecdotal reports indicate that fogging may be a useful mode of disinfection for Norovirus outbreaks aboard ship as well as in shoreside hotels.



Fogging Aboard Ship

- Should be considered an **adjunct** to thorough surface cleaning and disinfection
 - Allows for **supplemental** disinfection of known and potentially contaminated surfaces
 - Soft surface coverage – furniture, drapes, carpets, wall coverings



Fogging Checklist

- Efficacy & spectrum of disinfectant
- Volume of disinfectant
 - As per manufacturer's recommendation
 - General recommendation is 1 liter/100 m³
- Particle size
 - 10-20 micron diameter is optimal, will settle in 45-60 minutes in a non-ventilated room



Fogging Checklist

- Fogger nozzle location in room/cabin
 - 1-2 meters above floor
 - Higher location improves dispersal of disinfectant
 - Less coverage at higher areas of room
 - Less coverage at areas posterior to nozzle
 - Avoid wall and ceiling contact with nozzle plume
 - Disinfectant will concentrate on these surfaces



Fogging Checklist

- Active fogging period for surface disinfection
 - May be as little as the time needed to fog the required volume of disinfectant
 - Longer periods allow for better disinfectant dispersal and extended contact time
 - Handheld foggers and fans may help to increase disinfectant dispersal



Fogging Checklist

- Active fogging period for air disinfection
 - Should be at least as long as the disinfectant's recommended contact time
 - Longer periods allow for better disinfectant dispersal and extended contact time
- Dwell/contact time
 - As required by the specific disinfectant agent
 - For NV disinfectants, typically 5-10 minutes



Fogging Checklist

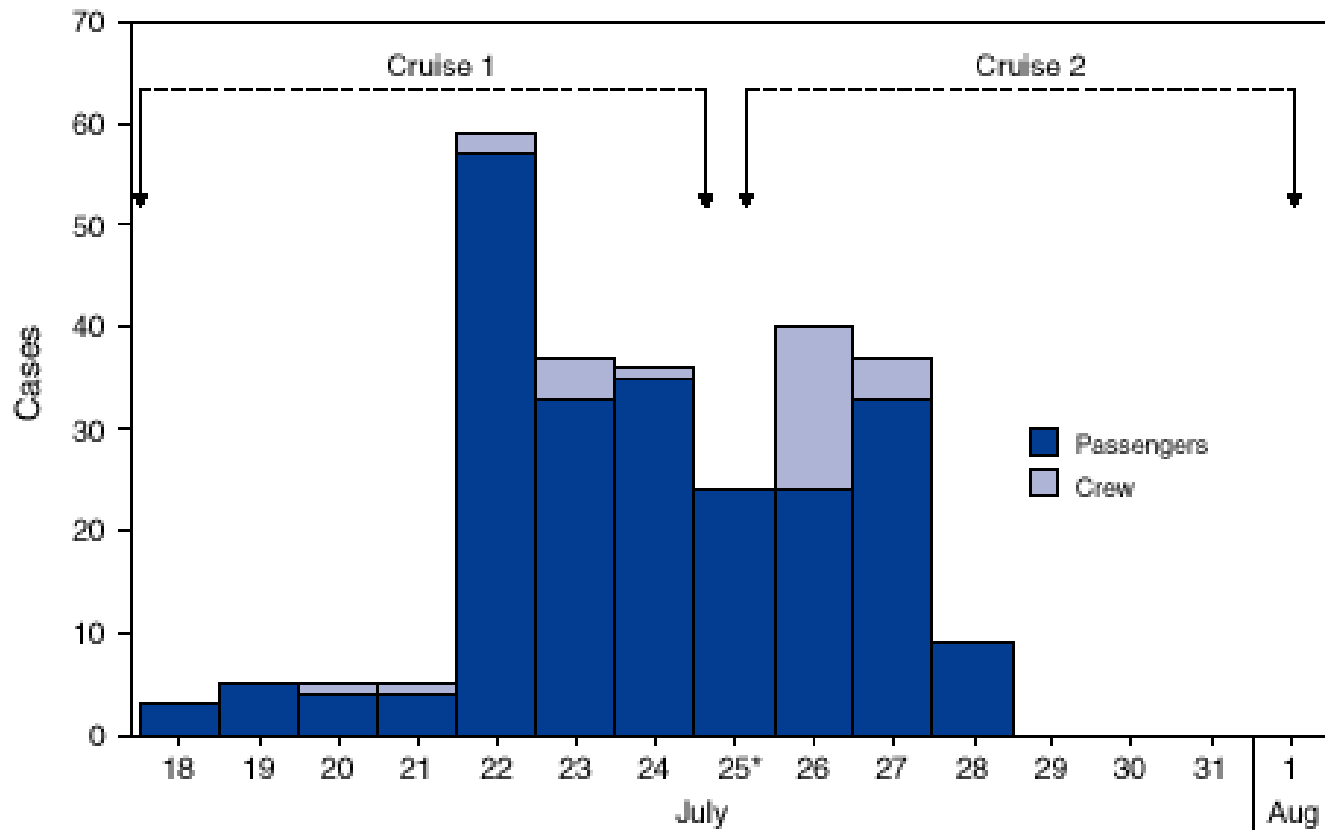
- Room closure
 - Allows time for disinfectant particles to settle on surfaces after active fogging
 - May be influenced by safety profile of disinfectant
 - Higher toxicity = Longer closure time
 - 45-60 minutes is recommended to ensure adequate contact time of disinfectant settled on surfaces and the safety of workers and occupants



Investigation

- Food intake history (72 hrs prior to illness)
- Passive and active surveillance surveys
- Identification of potential index case(s)
- Collection of stool, vomitus and blood samples for testing
- Development of epidemic curves

Norovirus Epidemic Curve



MMWR 2002, 51(49) Date of onset



Information/Education

- Alert passengers and crew of any outbreak
- Tell them what Norovirus is and how it is transmitted
- Advise them to seek medical evaluation for symptoms of vomiting and/or diarrhea
- If ill, strictly follow the isolation procedures
- Provide instructions for proper hand hygiene

Hand Hygiene

- Contaminated hands are probably the single most common vector for the spread of Norovirus



Stay Healthy—Wash Your Hands

Hand Hygiene

- Proper hand hygiene practiced by a majority of passengers and crew members could significantly decrease the incidence and extent of Norovirus outbreaks aboard cruise ships



Clean Hands are Healthy Hands

Handwashing and Respiratory Illness Among Young Adults in Military Training

MA Ryan; AJPM 2001, 21(2): 79-83

- ~90% attack rate for URI in 1996
- Operation Stop Cough 1997 through 1998
- Ordered to wash hands 5 times/day
- Incidence of URI decreased by 45%



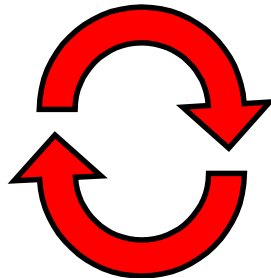
Hand Hygiene

- Can help to break the “recontamination cycle”

CONTAMINATION



DISINFECTION



RECONTAMINATION

Basic Handwashing Procedure

- Wet hands with water
- Apply soap
- Scrub hands together vigorously for at least 15 seconds
- Rinse with running water
- Dry (paper towel or blow dryer)
- Turn off faucet/open door with paper towel





Efficacy of Handwashing for FCV/Norovirus

- Running water ~ $2 \log_{10}$ (99%) reduction
- Soap & water ~ $3 \log_{10}$ (99.9%) reduction
- Antibacterial soaps offer no significant increased benefit for FCV/Norovirus

FRICITION & FLOW



Handwashing



**It's a
NO BRAINER**

Alcohol-based Hand Sanitizers

- A product must provide at least a $2 \log_{10}$ (99%) reduction in pathogens to be considered an effective hand sanitizer



DAMN IT! THE
BOOZE GOT ME



Efficacy of Alcohol-based Hand Sanitizers

- Dependent upon the specific agent, concentration and contact time
- propanol > ethanol > isopropanol
- Liquid > Gel > Foam
- 60-95% concentration



Efficacy of Alcohol-based Hand Sanitizers

- Amount for a 10-15 second contact time
 - 1 ml (2 cm diameter/nickel size of gel)
- Amount for a 20-30 second contact time
 - 2 ml (2.5 cm diameter/quarter size of gel)



Efficacy of Alcohol-based Hand Sanitizers

- Generally provide an overall **3-4 log₁₀ (99.9-99.99%)** reduction in bacterial and viral pathogens with a contact time of 15 seconds
- Non-enveloped viruses are more resistant and require an extended contact time
- FCV/Norovirus are typically reduced by only **1-2 log₁₀ (90-99%)** with a 30 second contact time



Manorapid Synergy[®] / VIRA-GARD[™]

- Hand sanitizer/antiseptic
- Active ingredients
 - Ethanol 54.1%
 - 1-propanol 10%
- Other ingredients
 - 1,2 propylene glycol 5.9%
 - 1,3 butanediol 5.7%
- Gel, liquid, spray, wipes





Manorapid Synergy[®] / VIRA-GARD[™]

- Proven efficacy against FCV
 - 2-3 log₁₀ reduction on hands @ 30 seconds
- Apply 3 ml for a 30 second contact time





Hand Hygiene

- Handwashing is especially important before eating and after using the restroom
- In Norovirus outbreaks, alcohol-based hand sanitizers should be considered an adjunct to handwashing and not a replacement

Clean Hands in Just a Minute



Handwashing vs. Sanitizers

Handwashing

- Hands visibly soiled
- After contact with bodily fluids
- Before eating
- After using the restroom

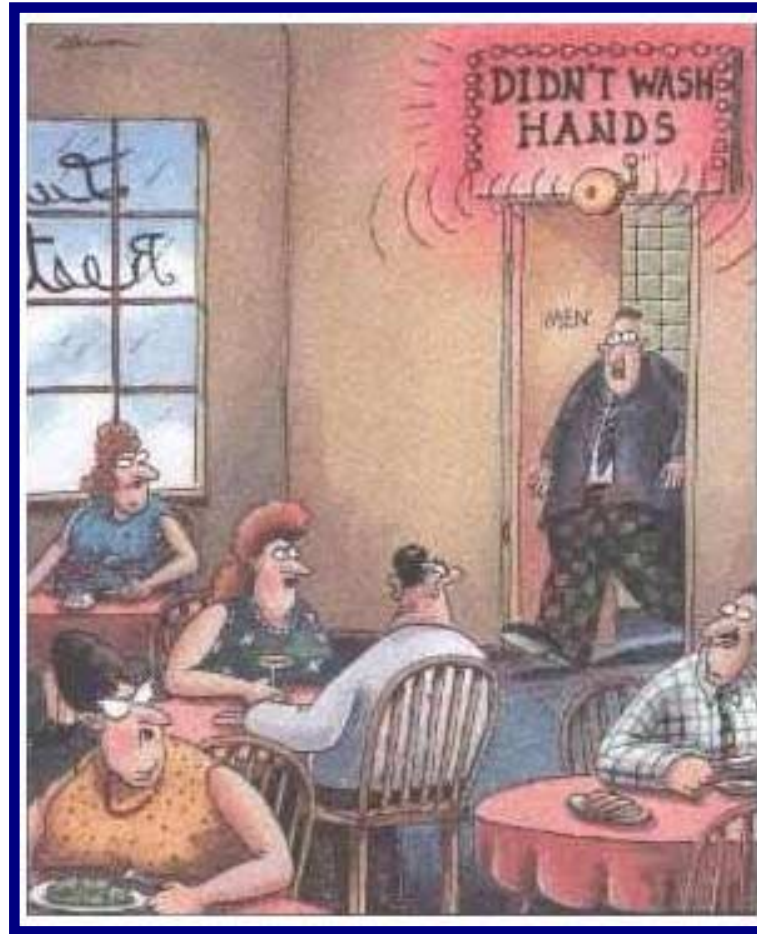
Sanitizers

- No visible soiling
- When soap & water are not available
- Between handwashings
- To supplement handwashing



Promotion of Proper Hand Hygiene

- Formal education to all crew during their sign-on orientation and via crew TV
- Notices to all passengers in their stateroom information folders
- Instructional signs in all public restrooms and private bathrooms



Don't Get Caught DIRTY HANDED!

www.washup.org



Summary

- Norovirus is a ubiquitous and highly contagious gastrointestinal pathogen
- Enhanced sanitation procedures are necessary to prevent and control Norovirus outbreaks aboard cruise ships
- Proper handwashing by passengers and crew members can have a significant impact on the spread of Norovirus in the cruise ship environment

Updated FBI Primer

Diagnosis and Management of Foodborne Illnesses:
A Primer for Physicians and Other Health Care Professionals



MMWR 2004, 53 (RR-4)

www.ama-assn.org/go/foodborne



BON VOYAGE!

...but wash your hands before you leave.



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